What is claimed is:

1. A self-mode locked multi-section semiconductor laser diode, comprising:

a complex-coupled DFB laser section that includes a complex-coupled grating and an active structure for controlling the intensity of oscillating laser light, to oscillate laser light in a single mode; and

an external cavity including a phase control section and an amplifier section, the phase control section having a passive waveguide that controls a phase variation of feedback laser light, the amplifier section having an active structure that controls the strength of the feedback laser light, the DFB laser section and the external cavity being monolithically integrated on a single substrate, current being independently injected into each of the sections.

2. The self-mode locked multi-section semiconductor laser diode as claimed in claim 1, wherein the laser diode has a buried heterostructure.

3. The self-mode locked multi-section semiconductor laser diode, as claimed in claim 1, wherein the laser diode has a ridge structure.

4. The self-mode locked multi-section semiconductor laser diode as claimed in claim 1, wherein the complex-coupled grating of the DFB laser section is a loss-coupled grating constructed in a manner in which a diffraction grating is formed in an additional absorptive layer, which longitudinally periodically varies both effective refractive index and loss.

5. The self-mode locked multi-section semiconductor laser diode as claimed in claim 1, wherein the complex-coupled grating of the DFB laser section is a gain-coupled grating constructed in a manner in which a diffraction grating is formed in an active structure, which longitudinally periodically varies both effective refractive index and gain.

6. The self-mode locked multi-section semiconductor laser diode as claimed in claim 1, wherein each of the active structures included in the DFB laser section and the amplifier section is formed in a manner in which a first light guiding layer, an active layer, and a second light guiding layer are sequentially deposited.

7. The self-mode locked multi-section semiconductor laser diode as claimed in claim 6, wherein each of the first and second light guiding layers is formed of InGaAsP having a band gap of 1.3μm and has a thickness of 70nm, and the active layer has a multi-quantum-well structure with a band gap of 1.55μm including wells and barriers according to InGaAsP.

8. The self-mode locked multi-section semiconductor laser diode as claimed in claim 6, wherein each of the first and second light guiding layers is formed of InGaAsP having a band gap of 1.3μm and has a thickness of 70nm, and the active layer is formed of InGaAsP having a band gap of 1.55μm.

9. The self-mode locked multi-section semiconductor laser diode as claimed in claim 1, wherein the guiding layer of the phase control section is arranged through butt-coupling such that its central axis accords with those of the active structures.

10. The self-mode locked multi-section semiconductor laser diode as claimed in claim 9, wherein the guiding layer has a thickness of 400nm and is made of InGaAsP having a band gap of 1.3μm.

11. The self-mode locked multi-section semiconductor laser diode as claimed in claim 1, wherein the DFB laser section, the phase control section, and the amplifier section are constructed through evanescent-coupling in which the sections have a common guiding layer.

12. The self-mode locked multi-section semiconductor laser diode as claimed in claim 1, wherein the phase control section is located between the DFB laser section and the amplifier section.

13. The self-mode locked multi-section semiconductor laser diode as claimed in claim 1, wherein the amplifier section is located between the DFB laser section and the phase control section.

14. The self-mode locked multi-section semiconductor laser diode as claimed in claim 1, wherein the facet of the DFB laser section is coated with an anti-reflection film, whereas the facet of the external cavity, opposite to the facet of the DFB laser region, is coated with a high-reflection film or is left as cleaved.